

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
19 February 2004 (19.02.2004)

PCT

(10) International Publication Number
WO 2004/015206 A2

(51) International Patent Classification⁷: **E02D 3/039**,
3/032

(21) International Application Number:
PCT/IB2003/003147

(22) International Filing Date: 5 August 2003 (05.08.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2002/6213 5 August 2002 (05.08.2002) ZA

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(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC,
SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA,
UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

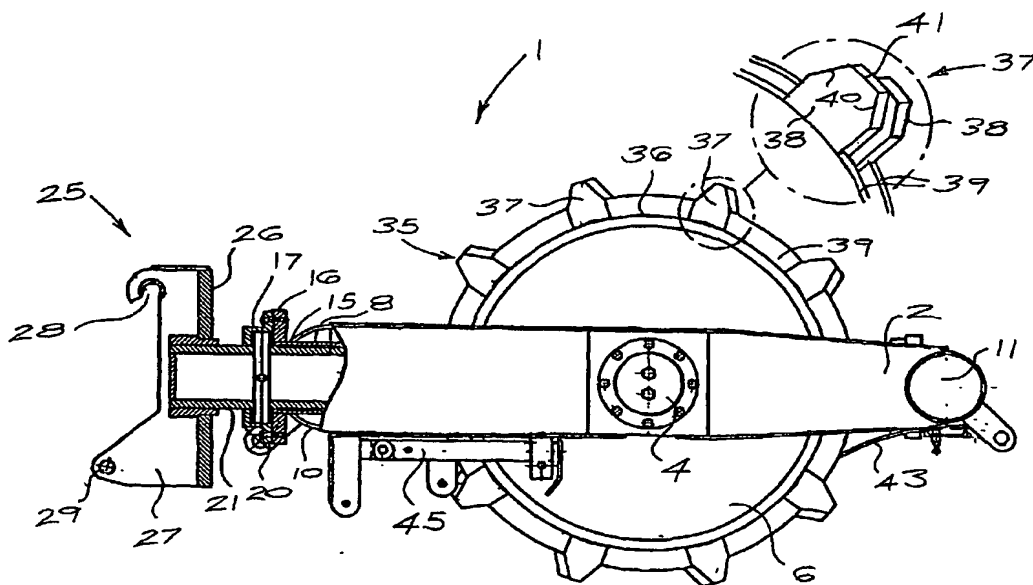
(84) Designated States (*regional*): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished
upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: A REFUSE COMPACTOR



(57) Abstract: This invention relates to apparatus for use in compacting refuse and comprises at least one roller secured to a chassis having a coupling for releasably securing the chassis to a boom of a front-end loader. The invention extends to a cleat for a roller which is formed from two halves offset from each other along a circumference of the roller.

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A REFUSE COMPACTOR

FIELD OF THE INVENTION

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This invention relates to apparatus for use in compacting refuse and extends to a cleat for a compacting roller.

BACKGROUND TO THE INVENTION

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It is an important aspect of waste disposal that refuse in tips be properly compacted. An effective machine exists for this purpose which is essentially a heavy vehicle having four wheels each in the form of a steel roller with a plurality of cleats thereon. These are also known as "Caron wheels". The cleats not only serve to provide traction but also to shear the refuse into smaller pieces. The major drawback of such machines is their cost which makes them difficult to afford. It is particularly not cost effective for smaller operators to make use of such machines, where the volume of waste to be disposed of is relatively small

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Rollers which are towed behind vehicles are thus frequently used. Front-end loaders, sometimes referred to as wheel loaders, are often used to tow the rollers as these vehicles are widely used on tips to move refuse. However, such rollers are not very effective simply because they do not have sufficient weight. They also tend to be cumbersome as they are difficult to manoeuvre and hence cannot be used in many situations.

OBJECT OF THE INVENTION

It is an object of this invention to provide a refuse compactor which will at least partially alleviate some of the abovementioned problems. It is a further object of this invention to provide an improved cleat for a compacting roller. It is a still further object of this invention to provide a method for compacting refuse which will at least partially alleviate some of the abovementioned problems.

SUMMARY OF THE INVENTION

In accordance with this invention there is provided a refuse compactor comprising at least one roller secured to a chassis having a coupling for releasably securing the chassis to a boom of a front-end loader.

Further features on the invention provide for the compactor to include a pair of independently rotatable rollers; for the rollers to be secured to a central axle; for each roller to have a plurality of cleats thereon; for the cleats to be formed in rows about the circumference of each roller; for each cleat to be formed from two halves offset from each other along a circumference of the roller; for the edges of each half of each cleat to taper to a flat end; for each half of each cleat to extend from a circumferential flange on the roller; and for the flanges to be spaced apart.

Yet further features of the invention provide for the chassis to be at least partly rotatable with respect to the coupling; and for the coupling to be rotatably secured to a shaft extending across the chassis intermediate the rollers.

- 5 Still further features of the invention provide for a stabiliser mechanism to restrict rotation of the chassis with respect to the coupling; for the stabiliser mechanism to provide a downward bias on the chassis on either side of the shaft; for the stabiliser mechanism to provide stops to limit the extent of rotation of the chassis with respect to the coupling; and for the stabiliser mechanism to
10 include at least one lock to secure the chassis and coupling against relative rotation.

- Further features of the invention provide for at least one scraper to extend from the chassis between each row of cleats on each roller; preferably for**
15 **a pair of scrapers to extend from opposite sides of the chassis between each row of cleats; for the scrapers to be made of a spring steel; and for there to be means to restrict the height to which the chassis can be lifted by a boom.**

20 **BRIEF DESCRIPTION OF THE DRAWINGS**

One embodiment of the invention will be described, example only, with reference to the drawings in which:

- 25 Figure 1 is a part sectional side elevation of a refuse compactor;
Figure 2 is a part sectional plan view of the refuse compactor in Figure 1;
Figure 3 is a front elevation of the stabiliser mechanism on the refuse compactor in Figure 1; and
Figure 4 is an elevation of the refuse compactor in Figure 1 secured to a
30 front-end loader.

DETAILED DESCRIPTION OF THE DRAWINGS

A refuse compactor (1) is shown in Figures 1 and 2 and includes a rectangular chassis (2) with an axle (4) secured centrally in the length thereof. A pair of
5 rollers (6) are independently rotatably secured to the axle (4). A shaft (8) extends across the width of the chassis (2) intermediate the rollers (6) and provides a support through which the axle (4) is secured.

The longer sides (10, 11) of the chassis (2) are formed from large diameter
10 steel tubing and joined together at their ends by channel sections (12,13). One end (15) of the shaft (8) extends through the side (10) of the chassis (2) and terminates in a flange (16). A collar (17) of similar external and internal diameter to the flange (16) but axially stepped along its length is secured to the
15 flange (16). A disc (20) is rotatably secured between the collar (17) and flange (16) by a bearing assembly (not shown). A tubular stem (21) extends through the collar (17) and is secured to the disc (20). The free end of the stem (21) is secured to a coupling (25) which is thus rotatable with respect to the chassis (2).

20 Each roller (6) has four equally spaced, circumferential rows of cleats (35) on its outer surface (36). As illustrated more clearly in the inset, each cleat (37) is formed from two halves (38) each of which extends from a circumferential flange (39) on the roller (6). The halves (38) each have the same shape, being elongate plates with the edges (40) tapered inwardly from the flange (39) to a
25 flat end (41), but are offset from each other along the circumference of the roller (6).

Three elongate, spring steel scrapers (43) are secured on each side (10, 11) of the chassis (2) adjacent each roller (6) to extend between the rows of cleats
30 (35).

A support leg (45) is secured to the lower side of the channel section (12) adjacent the side (10) and is movable between a stowed condition (as shown) in which it extends along the side of the channel section (12), and an operative condition in which it extends normally to the channel section (12) and supports the coupling (25) above the ground.

As illustrated more clearly in Figure 4, the coupling (25) is configured to be removably secured to the boom (50) of a front-end loader (51). These booms (50) are usually constructed to provide convenient fitting or removal of buckets, fork equipment, material handling arms, timber grapples, snow blades and the like. In this embodiment, the coupling (25) includes a plate-like base (26) secured centrally on one side to the stem (21) with a pair of side plates (27) extending normally from the opposite side at each end thereof. The upper end of each side plate (27) forms a hook (28) along its free edge while the lower end projects outwardly and has an aperture (29) therethrough for receiving a pin (not shown). The hook (28) and aperture (29) co-operate with complementary formations on the boom (50) in known fashion.

In use, the refuse compactor (1) is easily be fitted to the boom (50) of a front-end loader (1) enabling it to be easily manoeuvred. It also provides for efficient compaction of refuse when a number of initial runs are made over the refuse with the boom in a "free float" condition. In this condition the compactor (1) is free to follow the contours of the refuse with no pressure being inserted by the front-end loader (51). The rotatability of the chassis (2) with respect to the coupling (25) further enhances the ability of the compactor (1) to follow contours. During the initial runs the refuse is subjected to shearing and settling. Hereafter the boom (50) can be operated to exert downward force on the compactor (1) to the extent that the compactive effort can be increased to the point where it equals or exceeds that of most self-propelled refuse compactors currently available.

- The shape of the cleats (37) has been found to be particularly effective as the offset configuration of the two halves (38) of each cleat (37) provides a large periphery to each cleat (37) and more edges along which shearing can occur. Also, offsetting the two halves (38) provides each cleat (37) with a long, narrow
- 5 tread providing higher pressure for a longer period of time through the cleat (37). The cleats (37) have been found to be more effective than conventional designs which tend to be limited by the necessity for the cleat to provide traction to a wheel.
- 10 The scrapers (43) have also been found to provide superior performance over conventional scrapers which tend to be rigid. The nature of the scrapers (23) of the current invention allows them to flex rather than break where particularly hard material is encountered between the flanges (39).
- 15 As the flanges (39) of each row of cleats (35) are spaced apart dirt and other matter tends to collect between them. This proves favourable as the dirt enhances the structural integrity of the flanges (39) while also providing good resistance against wear.
- 20 A further advantage of the compactor (1) is that it may be lifted when being transported over roads or other areas not requiring compaction. This virtually eliminates the damage caused to roads by conventional equipment. Lifting the compactor (1) does however have the disadvantage that the compactor (1) tends to rotate with respect to the coupling (25) where one of the rollers (6) has
- 25 more refuse impacted thereon than the other. This can cause instability during transport, especially when travelling on slopes. Referring also to Figure 3, a pair of locking pins (60) are provided on either side of the base (26). During use of the compactor (1) the pins (60) are held retracted against a bias in a housing. When released from the retracted position, the pins (60) engage in
- 30 apertures in the side (10) of the chassis (2) and prevent rotation of the chassis (2) with respect to the coupling (25).

It is, however, not always convenient to lock the chassis (2) and coupling (25) together using the pins (60), for example where the compactor (1) is frequently lifted and moved short distances. A stabiliser mechanism (65) is thus provided
5 between the coupling (25) and chassis (2) and includes a pair of arms (66) pivotally secured at one end (67) to the base (26) above the stem (21) (as shown in Figures 2 and 3). A low friction pad (68) is secured to the lower most side of each arm (66) adjacent the free end (69) thereof. Each pad (68) rides on a part circular stop (70) extending from the side (10) of the chassis (2) on
10 opposite sides of the shaft (8). A coil spring (72) is secured between each arm (66) and the base (26) to provide a bias on each arm (66) towards its respective stop (70). Furthermore, each stop (70) extends a sufficient distance from the side (10) to engage the base (26) when it is rotated sufficiently with respect to the chassis (2). Each stop (70) is provided with a flat surface (73) configured to
15 abut against a rubber pad (75) on each side of the base (26) with the base (26) rotated into contact with the stop (70). The stops (70) thus limit the degree rotation of the coupling (25) with respect to the chassis (2).

In use, the arms (66) act on the chassis (2) to provide a bias opposite to the
20 direction of rotation about the stem (21). It will be appreciated that rotation of the chassis (2) in the direction of one of the arms (66) will cause the other arm (66) to be raised and to extend the spring (72) to which it is secured whilst the other spring (72). The spring (72) being expanded will exert a greater force on the arm (66) to which it is secured than the other spring (72) and hence bias
25 the chassis (2) in the direction opposite to its rotation. A stabilising effect against rotation of the chassis (2) with respect to the coupling (25) is thus produced with the stops (70) limiting the degree of overall rotation.

The stabiliser mechanism (65) has been found to be highly effective with the
30 springs (72) providing up to about 400 kilograms of torsional load each. It is envisaged, however, that dampers may be added to the springs.

To improve the stability of the front-end loader and compactor during transport, the hydraulic system that actuates the front-end loader bucket "roll back" is used to roll back the compactor. This greatly reduces the compactor mass overhang, that is the distance between the centre of the compactor mass and the front-end loader front axle.

From the drawings it will be noted that all the structural and wear parts of the compactor are of abnormal proportion when compared to conventional towed compactors. This abnormal design is required to withstand the extremely high shock loads and forces that are experienced when the compactor is operated on refuse sites with maximum front-end loader mass transfer to the compactor as it is possible that the entire mass on the front axle of the front-end loader can be transferred to the compactor.

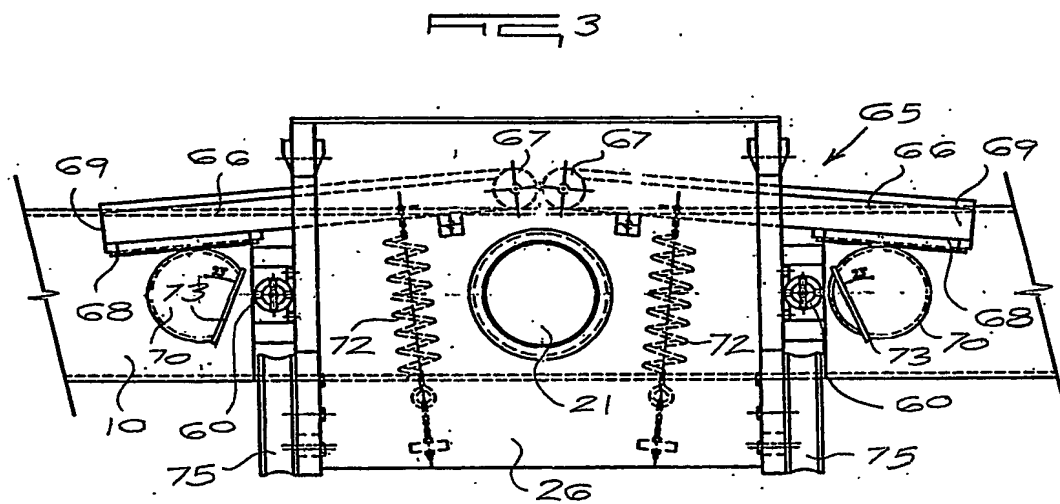
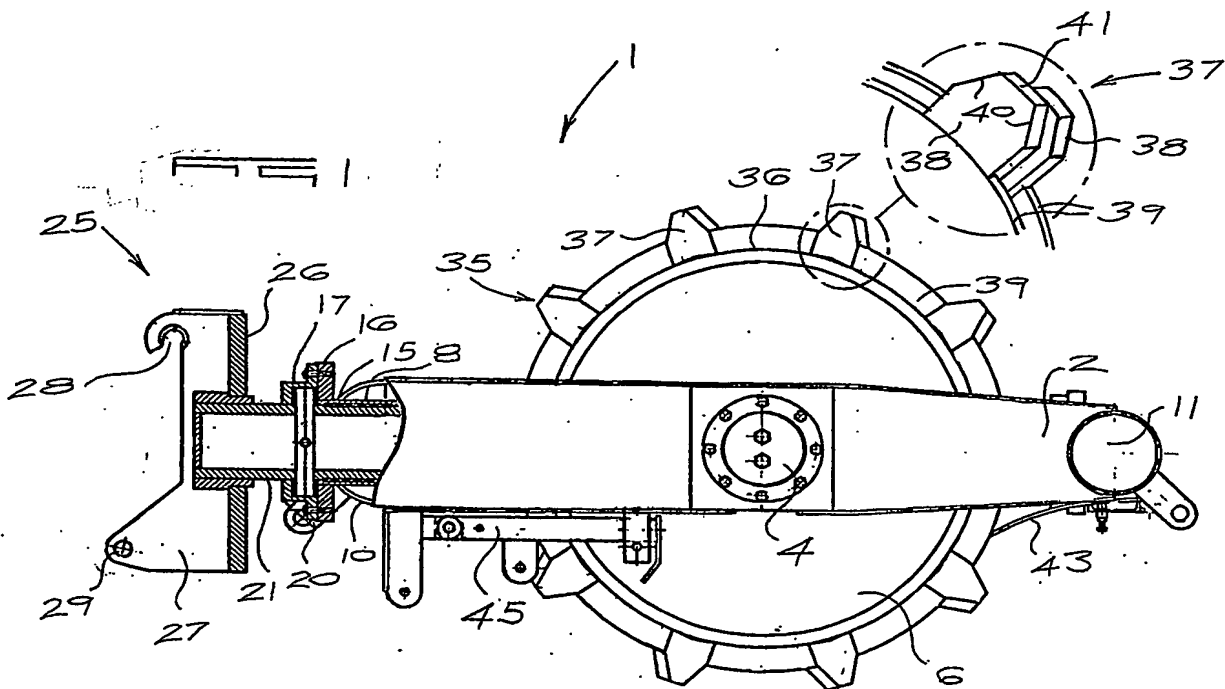
A highly effective yet relatively cheaply manufactured refuse compactor is thus provided. It is envisaged that the compactor will satisfy a need in countries varying from the First to the Third World with demand from First World countries in fact being far greater than that from Third World countries. It will be appreciated, however, that many other embodiments of a refuse compactor exist which fall within the scope of the invention particularly as regards the configuration thereof. For example, means can be provided to restrict the height to which the compactor can be lifted above the ground by a front-end loader. The coupling of the compactor can clearly be configured to provide a complementary fit with any suitable front-end loader. Also, any number of rollers could be used with any suitable cleat configuration.

CLAIMS

1. A refuse compactor comprising at least one roller secured to a chassis characterised in that the chassis has a coupling for releasably securing the chassis to a boom of a front-end loader.
5
2. A compactor as claimed in claim 1 in which a pair of independently rotatable rollers are secured to the chassis.
- 10 3. A compactor as claimed in claim 2 in which the rollers are secured to a central axle.
4. A compactor as claimed in any one of the preceding claims in which the or each roller has a plurality of cleats thereon.
15
5. A compactor as claimed in claim 4 in which the cleats are formed in rows about the circumference of the or each roller.
- 20 6. A compactor as claimed in claim 4 or claim 5 in which each cleat is formed from two halves offset from each other along a circumference of the roller.
7. A compactor as claimed in claim 6 in which the edges of half of each cleat taper to a flat end.
25
8. A compactor as claimed in claim 6 or claim 7 in which half of each cleat extends from a circumferential flange on the roller.
- 30 9. A compactor as claimed in claim 8 in which the flanges are spaced apart.

10. A compactor as claimed in any one of claims 2 to 9 in which the chassis is at least partly rotatable with respect to the coupling.
- 5 11. A compactor as claimed in claim 10 in which the coupling is rotatably secured to a shaft extending across the chassis intermediate the rollers.
12. A compactor as claimed in claim 11 in which a stabiliser mechanism restricts rotation of the chassis with respect to the coupling.
- 10 13. A compactor as claimed in claim 12 in which the stabiliser mechanism provides a downward bias on the chassis on either side of the shaft.
- 15 14. A compactor as claimed in claim 12 or 13 in which the stabiliser mechanism provides stops to limit the extent of rotation of the chassis with respect to the coupling.
- 20 15. A compactor as claimed in any one of claims 12 to 14 in which the stabiliser mechanism includes at least one lock to secure the chassis and coupling against relative motion.
- 25 16. A compactor as claimed in any one of claims 5 to 15 in which at least one scraper extends from the chassis between each row of cleats on each roller.
17. A compactor as claimed in claim 16 in which a pair of scrapers extends from opposite sides of the chassis between each row of cleats.
- 30 18. A compactor as claimed in claim 16 or claim 17 in which the scrapers are made of a spring steel.

19. A compactor as claimed in any one of the preceding claims in which there is a means to restrict the height to which the chassis can be lifted by a boom.
- 5 20. A cleat for a roller characterised in that the cleat is formed from two halves offset from each other along a circumference of the roller.
21. A cleat as claimed in claim 20 in which the edges of each half of each cleat taper to a flat end.
- 10 22. A cleat as claimed in claim 20 or claim 21 in which each half of each cleat extends from a circumferential flange on the roller.
23. A cleat for a roller substantially as herein described and as illustrated in Figure 1.
- 15 24. A compactor substantially as herein described and as illustrated in Figures 1 to 4.



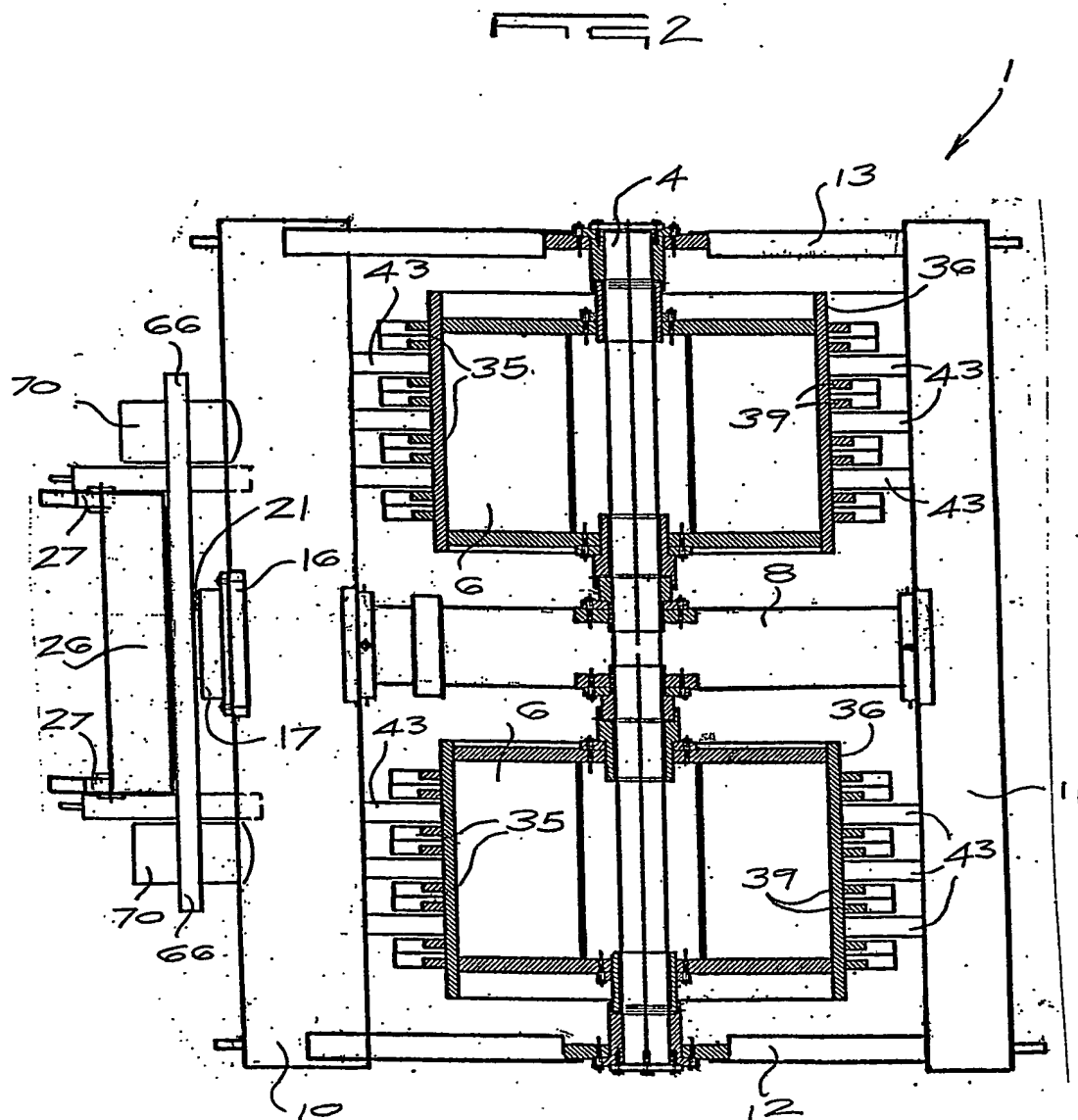
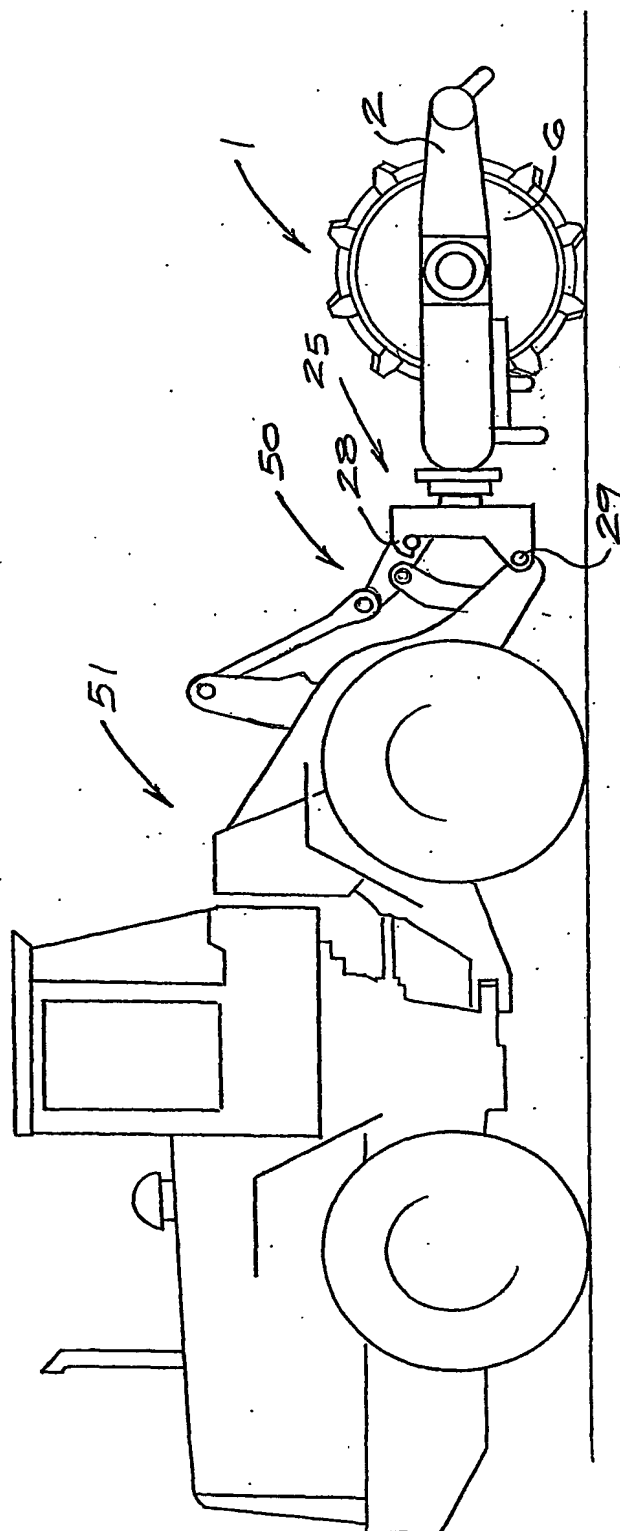


Fig 4



(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
19 February 2004 (19.02.2004)

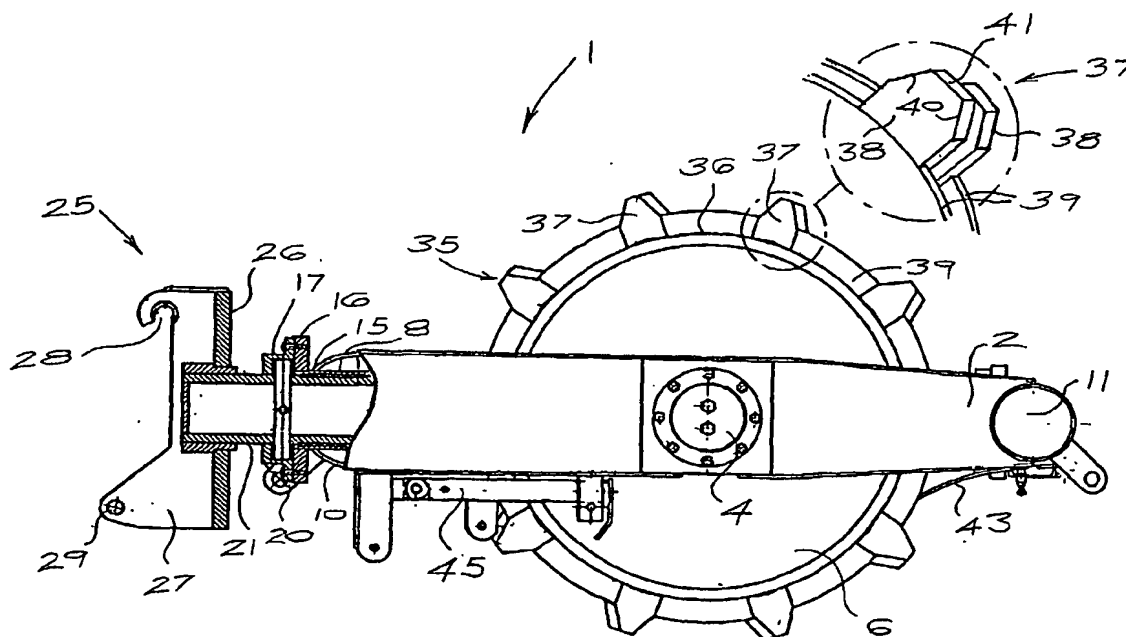
PCT

(10) International Publication Number
WO 2004/015206 A3

- (51) International Patent Classification⁷: E02D 3/039, 3/032
- (21) International Application Number: PCT/IB2003/003147
- (22) International Filing Date: 5 August 2003 (05.08.2003)
- (25) Filing Language: English
- (26) Publication Language: English
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CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC,
SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA,
UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
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KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:
— with international search report
— before the expiration of the time limit for amending the
claims and to be republished in the event of receipt of
amendments
- (88) Date of publication of the international search report:
21 May 2004

[Continued on next page]

(54) Title: A REFUSE COMPACTOR



(57) Abstract: This invention relates to apparatus for use in compacting refuse and comprises at least one roller (6) secured to a chassis (2) having a coupling (28) for releasably securing the chassis to a boom of a front-end loader. The invention extends to a cleat (37) for a roller which is formed from two halves offset from each other along a circumference of the roller.

WO 2004/015206 A3



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INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 03/03147

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 E02D3/039 E02D3/032

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 E02D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| X | US 6 171 020 B1 (PIKNA DAN ET AL) 9 January 2001 (2001-01-09) | 1,4,5, 9-15 |
| Y | column 2, line 57 - column 4, line 63; figures 1,4 | 16 |
| X | DE 197 11 649 A (HUGO WUPPER GMBH & CO KG ;LOBBE XENEX GMBH (DE)) 24 September 1998 (1998-09-24) | 1,4,5, 9-15 |
| Y | column 1, line 43 - column 6, line 9; figures 1,3 | 16 |
| X | GB 1 484 022 A (SISIS EQUIP) 24 August 1977 (1977-08-24) | 1-3 |
| Y | the whole document | 16 |
| | ----- -/-- | |

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

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Date of the actual completion of the international search

28 November 2003

Date of mailing of the international search report

12 03. 2004

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/IB 03/03147

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| Y | US 5 511 901 A (YATES STEVE K) 30 April 1996 (1996-04-30) column 1, line 57 - column 2, line 34; figure 1 | 16 |
| A | ----- CA 2 339 895 A (FROMHART ROSS) 6 September 2001 (2001-09-06) page 4, paragraphs 1,2 ----- | 6 |

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB 03/03147

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 23,24
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
Claims 23 and 24 do not contain searchable subject matter
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-19

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Claims Nos.: 23,24

Claims 23 and 24 do not contain searchable subject matter

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-19

A refuse compactor with at least one roller

2. claims: 20-22

A cleat for a roller

INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 03/03147

| Patent document cited in search report | | Publication date | Patent family member(s) | Publication date |
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| | | | DE 59810317 D1 | 15-01-2004 |
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